of the orbit and the mass of the stars, which I gave in my first communication on this subject. Upon the supposition of a circular orbit, the resulting period is 4·0134 days, while the two components have equal masses and a velocity of 12·3 miles per second. The mass of the system is 2·6 that of the sun, and the distance of each component from the common centre of gravity is 679,000 geographical miles. With a parallax of 0″·2 the maximum apparent distance amounts to 0″·014, so that the satellite cannot be seen with the strongest instrument.

"Finally, I must not omit to say that, by means of repeated examinations of the photographic plates and measurements of the spectrum, it appears more and more certain that the satellite of α Virginis has made itself apparent on the impressions. On several plates, taken at the time of maximum movement, one edge of the Hγ line seems to be rather more undefined and more gradually to diminish in intensity than the other edge; also on some other plates, taken at the time of minimum motion, the Hγ line seems to be rather narrower. These plates also show other lines in the spectrum more plainly on account of their being less faint. These appearances go to show that the satellite has a similar spectrum to the primary star, and that the Hγ line is also broad and faint, but so faint in comparison to the line in the spectrum of the primary star that its presence is only suspected after most careful examinations of the photographs. The phenomenon observed has no influence on the measurements. If, however, the spectrum of the satellite were stronger, it might exercise an influence on the measurements of the maximum motion by causing the differences to measure somewhat less than they really are.

"The satellite, if we grant that it really exists, is probably of about the third magnitude, and it may be possible that powerful reflectors may demonstrate its presence by showing more distinctly the slight periodic changes in the composite spectrum."

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 11, 1890.—"Photometric Observations of the Sun and Sky." By William Brennand. Communicated by C. B. Clarke, F.R.S.

The paper begins with a short account of the various papers communicated by Sir H. Roscoe, and published in the Transactions of the Royal Society.

My observations were made at Dacca, East Bengal, in 1861-66, repeated at Milverton, in Somersetshire, during the last two years. My first experiments were directed to ascertaining the action of the sun on sensitized paper exposed at right angles to the solar rays for different altitudes of the sun, and largely to ascertaining the laws of distribution of the actinic power in the sky.

I take no observations except when the sky is quite clear.

The method of measurement I adopted is the darkening produced in sensitized paper. I cut strips from one uniform sheet of ordinary photographic paper. My observations being relative, I obtain the same results (ratios) with any paper. I compare ultimately the effects of the sun and of a candle on this same paper.

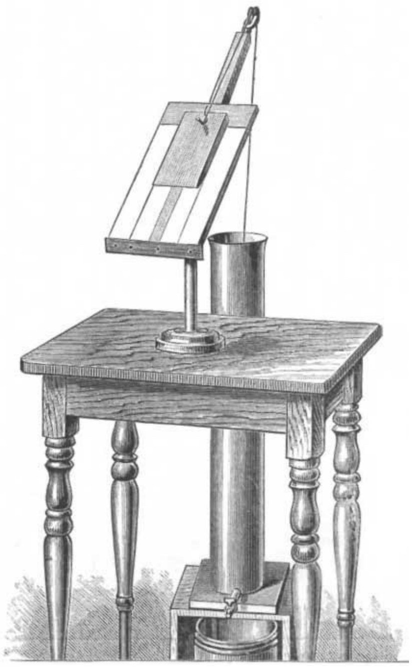
I assume that, in burning a stearine candle, the chemical action is proportional to the material consumed; I have taken as my unit (*i*) of measure of chemical action the darkening produced at a distance of 1 inch from the wick of the candle when 100 grains were consumed, which in the candle I used in India occupied about forty-seven minutes. My observations, being almost entirely relative, are independent of these assumptions, which affect hardly any of my results except comparisons with the absolute unit measures of Sir H. Roscoe.

The water-motion actinometer, with which observations of the action of sun and sky were made, is the instrument depicted in the photograph (see figure).

[The water-motion actinometer was shown and explained. By it, a shutter is removed with uniform velocity from a strip of sensitized paper, which is thus, by any light to which it is exposed, tinged with a gradually intenser depth from 0 to 16 seconds (the paper being suddenly covered at the end of 16 seconds). If, for example, at a particular altitude of the sun, the action of the sky alone in ·6 seconds produced the same depth of tint that the action of the sun alone produced in 10 seconds (in a similar strip cut from the same paper), then I estimate the chemical effect of the sun to have been $\frac{6}{10}$ that of the sky, *i.e.* it would be 0·6 if the effect of the sky was taken as the unit of measurement. In the same unit, the effect of the sun and sky together would be 1·6; that is, it would require $3\frac{3}{4}$ seconds' exposure to sun and sky together to produce the unit tint of measurement in the same paper, which calculated value could be immediately verified by another strip cut from the same paper. I have repeatedly made such verifications, which give me a test of the degree of accuracy with which tints can be matched.

By comparing a strip thus gradually shaded in proportion to the time, with another strip shaded as the inverse square of the distance from a near source of light, it is readily shown that the effect of a light acting at the distance unity for four seconds is equal to that of the same light acting at the distance $\frac{1}{2}$ for one second.

Observations of these ratios can be made with any *uniform* piece of paper from which the strips are cut. In the early experiments at Dacca I prepared sheets of sensitized paper with great care. I have found, in later experiments at Dacca and in Somersetshire, that any sheet of fairly good photographic paper gives satisfactory results; *i.e.* the error introduced by want of uniformity in one sheet of paper is inappreciable in comparison with the margin of possible error in the "reading," *i.e.* the matching of tints.



Water-motion actinometer.

I originally took as my unit of absolute measurement a particular tint produced in a piece of particular paper by a Dacca candle. I found that at an altitude α of the sun this tint was produced (by the effect of the sun alone) in the same paper in (say) 16 seconds, *i.e.* the effect of the sun alone at altitude α was represented by the number $\frac{1}{16} = 0{\cdot}0625$. By the system of ratios, I found the corresponding numbers for all altitudes 10° to 45°. These ratios were the means of very numerous observations extending over several cold seasons at Dacca where I had a perfect sky for months. If at any time I wish to recover the Dacca unit of measurement *in any particular paper*, I take a sun strip (at any altitude of the sun, γ) in the water-motion actinometer; I see in my table (B) that for the altitude γ the effect of the sun alone is (say) 0·12; I make a mark on my sun strip at the point where it has been exposed $8\frac{1}{3}$ seconds; the effect at that point in that paper is my Dacca unit.

My English observations have been taken in this manner without any reference to a candle. The observations of Sir H

Roscoe, apart from my own very numerous observations, show the chemical effect of the sun to be always the same (in a perfectly clear sky) at the same altitude.]

For obtaining the effects of the sun and sky, I have always experimented mainly by exposing the paper at right angles to the sun's rays. Sir H. Roscoe, on the other hand, exposes his paper on a horizontal plane. Theoretic considerations have led me to another method of observation (with the "octant" actinometer below) which gives directly the measure of the effect really desired.

A table is given of the first observations I made, which afterwards led to the formation of Table B.

TABLE B.—*Chemical Action of the Sun and Sky.*

Sun's altitude.	Sun alone.	Sky alone.	Sun and sky together.	Sun's altitude.	Sun alone.	Sky alone.	Sun and sky together.
1	·001	·003	·004	31	·110	·064	·174
2	·002	·005	·006	32	·113	·064	·178
3	·003	·007	·010	33	·116	·065	·181
4	·004	·010	·014	34	·118	·065	·184
5	·006	·012	·019	35	·121	·066	·188
6	·009	·016	·025	36	·124	·066	·190
7	·012	·019	·031	37	·126	·067	·193
8	·016	·022	·038	38	·129	·067	·196
9	·020	·026	·045	39	·131	·068	·199
10	·024	·029	·052	40	·133	·068	·201
11	·028	·032	·060	41	·135	·069	·204
12	·033	·035	·068	42	·137	·069	·206
13	·038	·038	·075	43	·138	·069	·208
14	·043	·040	·082	44	·141	·069	·210
15	·047	·042	·090	45	·143	·070	·213
16	·052	·045	·097				
17	·057	·048	·105				
18	·061	·049	·110				
19	·066	·050	·116				
20	·070	·052	·122	50	·150	·071	·221
21	·075	·053	·128	55	·157	·072	·229
22	·079	·054	·134	60	·162	·073	·235
23	·083	·056	·139	65	·166	·073	·239
24	·086	·057	·144	70	·170	·073	·243
25	·091	·058	·149	75	·172	·074	·246
26	·094	·059	·153	80	·173	·074	·248
27	·097	·060	·158	85	·175	·074	·249
28	·101	·061	·162	90	·175	·074	·249
29	·104	·062	·166				
30	·107	·063	·170				

N.B.—For sun altitudes 50° to 90°, the figures are not the result of direct observations; for sun altitudes 1° to 10°, the figures are less certain by reason of thin haze often present.

The numbers of the table were obtained, by taking the inverse of the times required at each altitude for producing the darkening of the candle unit.

I found the chemical action of the sun, as far as my experiments went, the same at all hours of the day and at all seasons of the year. And in Somersetshire I got exactly the same chemical action of the sun as at Dacca. Observations near the horizon cannot be depended upon.

Various observations had led me to suspect that the chemical action of the sky at the same moment was different in different parts of it. To investigate this suspicion, I designed an instrument which I call the mitrailleuse actinometer. I mount a number of similar cylindrical tubes in one plane in a semicircle, to the centre of which the axis of each tube is directed: one extremity of each tube lies in the circumference of the circle; the other extremities lie on a concentric circle of about one-half the radius. In the circumference of this smaller circle is a semicircular series of holes, against which a semicircular block carrying the sensitized paper is pressed by a screw. Each cylinder cuts out of the sky a circle of 8° 28′ angular diameter. One of the tubes near its top carries a small plate of wood on which stands a stile parallel to the tube, by means of which this particular tube can be brought in a line with the sun. By another motion the plane of the tubes can be adjusted to the plane of symmetry (or elsewhere).

[A vertical plane through the sun at any time divides the visible sky into two exactly similar portions. I call this the plane of symmetry.]

The observations (Table C) were taken December 23, 1864, at Dacca (among other similar observations taken in the same cold weather) in the plane of symmetry. The barrels of the mitrailleuse were fixed 10° apart, the altitude of the sun being 42° 28′.

I give the table as an early observation that shows well that there is a point of minimum sky intensity at 90° from the sun. It also appears that if i_α be the intensity for the altitude α of the sun ($= 0{\cdot}12$), then the intensity of the sky at a point $\theta°$ from the sun is given (roughly only according to this table) by the formula

$$i_\alpha \operatorname{cosec} \theta.$$

This observation was made in the plane of symmetry: it turns out that the value, $i_\alpha \operatorname{cosec} \theta$, gives the intensity very accurately, for any point, in any other *great* circle, whose distance from the sun is $\theta°$ measured on that circle.

For any altitude of the sun (α), the chemical action of the sky is a minimum at all points in a great circle the plane of which is at right angles to the line joining its centre to the sun.

[This plane I call the plane of minimum intensity (i_α).]

As the whole of the mathematical developments of this paper are founded upon the law that at any point of the sky whose distance is $\theta°$ from the sun

$$\text{the intensity} = i_\alpha \operatorname{cosec} \theta,$$

I have been careful to verify it by numerous observations both at Dacca and in Somersetshire, and also to vary the observations in every way I could devise. Thus the mitrailleuse has been placed in the plane of minimum intensity. In this case all the barrels give the same reading for points not too near the horizon.

Next the mitrailleuse was placed in planes of great circles through the sun at various angles with the plane of symmetry; by turning it round the line joining one of its tubes with the sun the observed chemical actions agree well with

$$i_\alpha \operatorname{cosec} \theta.$$

Next by means of stops I made the aperture of each barrel of the mitrailleuse to be

$$c \sin \theta,$$

where $\theta°$ is the distance of the axis of the barrel from the sun; this mitrailleuse being exposed, the barrel $c \sin 0$ being directed to the sun, the circular darkened spots were found to be very accurately of the same depth.

Further, I calculated the *times* of exposure for a (particular) mitrailleuse with barrels of uniform aperture, which ought, on the law $i_\alpha \operatorname{cosec} \theta$, to give a uniform tint. I exposed this mitrailleuse for these calculated times, first in the plane of symmetry, afterwards in a plane inclined to it at 62°; the results agreed closely with my anticipation, and show $i_\alpha \operatorname{cosec} \theta$ to be a very good approximation.

I have therefore made full use of the expression $i_\alpha \operatorname{cosec} \theta$ for the chemical action of the light of the sky in a circle θ from the sun (whose altitude is α).

I calculate (having given me i_α, the chemical action in the circle of minimum intensity) the total chemical action of the sky, first, on a plane exposed at right angles to the sun; second, on the horizontal plane. The first is an elliptic integral, the second is $2i_\alpha(\pi \sin \alpha + 2 \cos \alpha)$. By these values I am able to compare some of Sir H. Roscoe's observed values with my own.

The mathematical processes in reducing these integrals suggested to me (within the last few months) the construction of the octant actinometer, a new instrument which I tried in Somersetshire in October last. I am fairly satisfied with the results considering the imperfect sky of England. This instrument measures the value i_α directly; and it possesses, moreover, the great advantage of not taking in the low band of sky near the horizon, and thus avoids a principal element of uncertainty in other observations.

Geological Society, December 17, 1890.—Mr. W. H. Hudleston, F.R.S., Vice-President, in the chair.—The following communications were read:—On nepheline rocks in Brazil: ii. the Tingua mass, by Mr. O. A. Derby. In a former paper the general distribution of the nepheline rocks, so far as known, was given, with a particular description of a single one, the Serra de Pocos de Caldas. The present paper treats of a second mass, the Serra de Tingua, a high peak of the Serra do Mar, some forty miles from Rio de Janeiro. This peak is essentially a mass of foyaite rising to an elevation of 1600 metres, on the crest and close to the extremity of a narrow gneiss ridge of a very uniform elevation of about 800 metres. As seen from a distance, the conical outline and a crater-like valley on one side are very suggestive of volcanic topography. In the structure of the mass both massive and fragmental eruptives are found, the former greatly predominating. The predominant rock is a coarse-grained foyaite which is found everywhere in loose blocks about the margins of the mass, but not extending beyond it. In the numerous cuttings in the immediate vicinity, dykes of phonolite and basic eruptives (augitite) are exceedingly abundant, foyaite never appearing in a dyke form. There is, however, abundant evidence that foyaite and phonolite are but different phases of the same magma. Aside from the dyke phonolites, true effusive phonolites associated with fragmental eruptives (tuffa) were found high up in the crater-like valley, proving that the mass was a volcanic centre in the most restricted sense of the word. This conclusion affords an explanation of some of the peculiarities of the foyaite, which has many characteristics of effusive eruptives mingled with those of the deep-seated ones (*Teifengesteine*). These have, aside from the porphyritic structure, a *schlieren* structure revealed by a peculiar fluted weathering (illustrated by a photograph) and the presence of pseudo-crystals in the form of leucite. Stratigraphically the Tingua foyaites lie in sheet-like masses like lava-flows, extending from the higher to the lower portions of the mountain, the underlying gneiss being revealed at nearly all levels, wherever the mass has been scored by streams. The general fragmentary character of the rock seems to be due to the undermining of these sheets. Specimens and photographs illustrating the peculiar pseudo-crystals in the form of leucite that occur in both the foyaites and phonolites of Tingua (although no leucite has been detected in the rock) were exhibited and discussed. After the reading of this paper there was a discussion, in which the Chairman, Mr. Bauerman, Mr. Hulke, Prof. Green, and the author took part.—The variolitic diabase of the Fichtelgebirge, by Mr. J. Walter Gregory.

Edinburgh.

Royal Society, December 15, 1890.—Prof. Crum Brown in the chair.—Prof. Tait communicated a paper, by Dr. E. Sang, on the extension of Brouncker's method to the comparison of several magnitudes. The method employed is essentially an application of continued fractions.—Prof. Tait also communicated a paper by Mr. A. M'Aulay, on proposed extensions of quaternion powers of differentiation. In this paper, Mr. M'Aulay discusses a proposed modification of quaternion notation which leads directly to remarkable extensions in the mathematical treatment of the theories of elasticity and of electricity. His object in communicating this paper to the Society is to obtain information as to the likelihood of his modified notation—which is entirely opposed to ordinary conventions—being accepted by scientific men.—Prof. Ewing exhibited a model illustrating a molecular theory of magnetism. The model consists of a number of pivoted magnets which are arranged in parallel rows. These magnets are placed in the interior of a rectangular coil of copper wire, around which an electric current can be made to pass. So long as no current passes around the wire, the magnets arrange themselves in positions of stable equilibrium under their mutual forces, some of them pointing in one direction, some in another. This illustrates the condition of non-magnetized steel. If a feeble current be now passed round the coil, each magnet is slightly turned from its first position, which, however, it reassumes when the current is stopped. This illustrates the first stage of the process of magnetization. A somewhat stronger current causes instability among the originally less stable groups of the magnets, so that the magnets composing these groups swing round into a new stable position. As the strength of the current increases still further, more and more groups break up, until all have taken the new position of equilibrium under their own mutual forces and the external directive force. This illustrates the second stage of magnetization, in which the ratio of magnetization to magnetizing force increases with great rapidity. The third stage, in which the above ratio is practically constant, is exemplified by the fact that an infinite force is now needed to make the magnets point exactly in the direction of the external lines of force. If the current be now stopped, a considerable proportion of the magnets retain their final position of equilibrium—in other words, magnetic retentiveness is exhibited. The model may be made to exhibit the effects of strain on the magnetic properties. For this purpose the magnets are placed on a sheet of india-rubber. If the india-rubber is stretched, the magnets are separated out from each other in one direction, and are brought nearer to each other in a direction at right angles to the former. The magnetic susceptibility is increased, or diminished, according as the stability of the magnets is diminished, or increased, by the alteration of relative position. Similarly, the increase of the susceptibility of iron with rise of temperature is explained by the diminution of mutual magnetic influence which results from increased distance. Prof. Ewing suggests that the total loss of magnetization which occurs at a high temperature is due to continuous whirling motion of the magnetic molecules. The dissipation of energy which occurs when hysteresis is exhibited is due to the induced currents which are caused by angular motions of the magnets.—Dr. Gulland read a paper on the development of adenoid tissue. He believes that ingrowth of the epithelium (for example, in the development of the tonsils) compresses the connective tissue, and renders difficult the passage of leucocysts. The leucocysts consequently increase in numbers at the part, and eat their way through the condensed tissue.

Sydney.

Royal Society of New South Wales, October 1, 1890.—Dr. Leibius, President, in the chair.—A discussion took place upon the paper read at the September meeting by Prof. Warren, on some applications of the results of testing Australian timbers to the design and construction of timber structures.

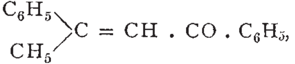
November 5.—Dr. Leibius, President, in the chair.—The following papers were read:—Geological notes on the Barrier Ranges silver field, by C. W. Marsh.—Record of hitherto undescribed plants from Arnheim's Land, by Baron Ferd. von Mueller, K.C.M.G., F.R.S.—Some folk songs and myths from Samoa, translated by Rev. T. Powell and Rev. G. Pratt, with an introduction and notes by Dr. John Fraser.—Mr. H. C. Russell, C.M.G., F.R.S., exhibited and described some of the surprising star photographs recently taken at Sydney Observatory.

Paris.

Academy of Sciences, December 29, 1890.—M. Hermite in the chair.—List of prizes awarded to successful competitors in 1890:—*Geometry:* Grand Prix des Sciences Mathématiques, M. Paul Painlevé; honourable mention, M. Léon Autonne; Prix Bordin (not awarded); Prix Francœur, M. Maximilien Marie; Prix Poncelet, M. le général Ibañez. *Mechanics:* Extraordinary Prize of 6000 francs—this has been divided between M. Madamet, MM. Ledieu and Cadiat, and M. Louis Favé; Prix Montyon, M. le colonel Locher; Prix Plumey, M. Jules-Ernest Boulogne. *Astronomy:* Prix Lalande, M. J. V. Schiaparelli; Prix Damoiseau (not awarded); Prix Valz, Prof. S. de Glasenapp; Prix Janssen, Prof. C. A. Young. *Statistics:* Prix Montyon, Dr. Paul Topinard; honourable mention, M. Dislère. *Chemistry:* Prix Jecker, divided between the late M. Isambert and M. Maurice Hanriot. *Geology:* Prix Vaillant, M. Marcel Bertrand; Prix Fontannes, M. Ch. Depéret. *Physical Geography:* Prix Gay, M. Franz Schrader. *Botany:* Prix Desmazières, M. Maurice Gomont; Prix Montagne, divided between M. Paul Hariot and Dr. Albert Billet. *Anatomy and Zoology:* Prix Bordin (not awarded); Prix Savigny, divided between Dr. Jousseaume and M. R. P. Camboué; Prix Thore (not awarded); Prix Serres, M. Camille Dareste. *Medicine and Surgery:* Prix Montyon, divided between M. Félix Guyon, M. Auguste Ollivier and M. Paul Richer; mentions were accorded to M. Ch. Fiessinger, MM. J. Chauvel and H. Nimier, and M. Ch. Mauriac; Prix Bréant, divided between M. G. Colin and M. A. Layet; Prix Godard, M. Samuel Pozzi: honourable mention, MM. Ch. Monod and O. Terrillon; Prix Barbier, M. Claude Martin; honourable mention, M. Gaston

Lyon and M. B. Dupuy; Prix Lallemand, divided between Mme. Déjerine-Klumpke and M. G. Guinon; Prix Dusgate (not awarded); Prix Bellion (not awarded); Prix Mège, M. Nicaise. *Physiology:* Prix Montyon, divided equally between M. E. Gley and M. E. Wertheimer; honourable mention, M. E. A. Alix and MM. G. Arthaud and L. Butte; Prix Pourat (not awarded). *General Prizes:* Prix Montyon (Unhealthy Industries), M. Casimir Tollet; Prix Jérome Ponti, M. R. P. Colin; Prix Trémont, M. Beau de Rochas; Prix Gegner, M. Paul Serret; Prix Delalande-Guérineau, Dr. Verneau; Prix de la fondation Leconte, M. Prosper de Lafitte; Prix Laplace, M. Bailly.—The following prizes were proposed for the year 1891:—Prix Francœur: For discoveries or useful works tending to further the progress of pure and applied mathematics. Prix Poncelet: For the author of any work tending most to further the progress of pure and applied mathematics. Extraordinary Prize of 6000 francs: Any improvements tending to increase the efficiency of the French naval forces. Prix Montyon: Mechanics. Prix Plumey: Improvement of steam-engines or any other invention contributing most to the progress of steam navigation. Prix Dalmont: For the engineer who shall present to the Academy the best work on bridges or on highways. Prix Fourneyron: Improvements in the theory of steam-engines which take most account of the exchanges of heat between the water and the cylinders and tubes. Prix Lalande: Astronomy. Prix Damoiseau: Improvements of the lunar theory which consider inequalities of long-period caused by planets. Prix Valz: Astronomy. Prix Janssen: Astronomical physics. Prix Montyon: Statistics. Prix L. La Caze: The best work on physics, chemistry, and physiology. Prix Jecker: Inorganic chemistry. Prix Delesse: The author of the best work on geological science, or, in default of such, mineralogical science. Prix Bordin: The study of the phenomena of the fecundation of Phanerogamic plants, with particular reference to the division and transport of the cellular nucleus; also the study of the connections which exist between these phenomena and those observed in the animal kingdom. Prix Bordin: Comparative study of the auditory nerves of warm-blooded Vertebrata; Mammiferæ and Birds. Prix Desmazières: The best work on the whole or any part of Cryptogamic flora. Prix Montagne: The author of important works on the anatomy, physiology, development, or description of the lower Cryptogamic plants. Prix Thore: Works on the cellular Cryptogams of Europe, and on the habits or anatomy of any species of European insect, alternately. Grand Prix des Sciences Physiques: On the organs of sense of Invertebrata, from an anatomical and physiological point of view. The prize may be awarded for a complete work on one of the organs of sense in a group of Invertebrata. Prix Savigny: For young zoological travellers. Prix da Gama Machado: On the coloured parts of the tegumentary system of animals, or on the genital matter of living beings. Prix Montyon: Medicine and surgery. Prix Bréant: The discovery of a cure for Asiatic cholera. Prix Godard: On the anatomy, physiology, and pathology of genito-urinary organs. Prix Chaussier: Important works in legal or practical medicine. Prix Barbier: The most important discovery in surgery, medicine, pharmacy, and botany, having reference to the healing art. Prix Lallemand: Researches on the nervous system in the widest sense of the term. Prix Bellion: Works or discoveries serviceable to the health or to the improvement of the human species. Prix Mège: The author of a continuation and completion of Dr. Mège's essay on the causes that have retarded or favoured the advancement of medicine. Prix Montyon: Experimental physiology. Prix Pourat: Functions of thyroid bodies. Prix Martin-Damourette: Therapeutic physiology. Prix Gay: Newly formed lakes and how they become stocked. Prix Montyon: Unhealthy industries. Prix Cuvier: The most remarkable work on the animal creation, or on geology. Prix Trémont: For any naturalist, artist, or mechanic, needing help for carrying out any project useful and glorious for France. Prix Gegner: In aid of any man of science distinguished for his works towards the advancement of the positive sciences. Prix Jean Reynaud: For the most meritorious work produced in a period of five years. Prix Petit D'Ormoy: Pure and applied mathematics, or applied and natural science. Prix Laplace: For the best student leaving the École Polytechnique.

BRUSSELS.

Academy of Sciences, November 8.—M. Stas in the chair.—On the variations in latitude observed at Berlin, Potsdam, and Prague, by M. F. Folie. The periodical changes in the declination of stars, due to aberration, is adduced as a possible cause of latitude variation.—On the Belgium graptolites, by Prof. C. Malaise.—On the points of variation in cubes, by M. Cl. Servais.—On dypnone,  $(C_6H_5)(CH_5)C = CH . CO . C_6H_5$, by M. Maurice Delacre.—On the new species *Posadæa*, belonging to the family of Cucurbitaceæ, by M. Alfred Cogniaux.—The reduction of nitrates to nitrites by seeds and tubercles, by M. Émile Laurent. The author makes known the results of his new researches on the reduction of nitrates. He has experimented on Indian corn, barley, peas, white lupines, broad beans and kidney beans, previously sterilized, but afterwards allowed to germinate. The crops obtained are immersed in a 1 per cent. solution of potassium nitrate, and give rise to the production of potassium nitrite. With regard to this action it is concluded that "La réduction des nitrates en nitrites par les végétaux est, comme la fermentation alcoolique, une conséquence de la vie qui se continue dans un milieu privé d'oxygène libre." This reduction of nitrates by the tubercles of the Jerusalem artichoke, radish, turnip, &c., by their petioles, and by the peduncles and fruits of different plants, has also been observed.

STOCKHOLM.

Royal Academy of Sciences, December 10, 1890.—The third and fourth part of "Erythræe exsiccatæ" exhibited and commented on by Prof. Wittrock.—On the genera Kurutas, Nidularium, and Regelia, of the family of the Bromeliaceæ, by Dr. C. Lindman.—Researches on the structure of the central nervous system of the Evertebrates and especially of the Crustacea, and in general on the connection between the nervous cells and nervous filaments in the nervous central organs, by Prof. G. Retzius.—Contributions to the question of secular perturbations, by Dr. K. Bohlin.—The influence of the temperature on the capillary constants of some fluids, by Herr Tinnberg.—On the reaction of the iodohydric acid on 1-6 nitro-naphthalin-sulphon-acid-amid, by Herr A. Ekbom.—"Sur la notion de l'énergie libre," by Herr A. Rosén.

CONTENTS.

PAGE
The South Kensington and Paddington Subway Railway . . . 217
Are the Effects of Use and Disuse Inherited? By Prof. George J. Romanes, F.R.S. . . . 217
Technical Education . . . 220
Our Book Shelf:—
Conwentz: "Monographie der baltischen Bernsteinbäume."—**W. B. H.** . . . 221
Green: "The Birth and Growth of Worlds" . . . 221
"Chambers's Encyclopædia," Vol. VI. . . . 221
Letters to the Editor:—
Shaking the Foundations of Science.—**Major-General C. E. Webber, R.E.** . . . 222
The Darkness of London Air.—**F. H. P. C.** . . . 222
A Remarkable Flight of Birds.—**Rev. E. C. Spicer** 222
On the Flight of Oceanic Birds. (*With Diagrams*).—**Captain David Wilson-Barker** . . . 223
The Locomotion of Arthropods.—**H. H. Dixon** . . 223
Attractive Characters in Fungi.—**Worthington G. Smith; Dr. M. C. Cooke** . . . 224
The Researches of Dr. R. Kœnig on the Physical Basis of Musical Sounds. II. (*Illustrated.*) **By Prof. Silvanus P. Thompson** . . . 224
Dr. Henry Schliemann . . . 227
The Meteorite of Oschansk. (*Illustrated.*) . . . 228
Notes . . . 230
Our Astronomical Column:—
Perihelia of Comets . . . 232
Gaseous Illuminants. By Prof. V. B. Lewes . . . 233
On the Orbit of α Virginis . . . 235
Societies and Academies . . . 237